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You Never Saw a Burner Like This!

You've seen a lot of gas burners but for perfect combustion, safety, economy and satisfactory control you've never seen a burner like the

Toledo Automatic Gas Burner

Heats on low pressure where others fail.

Burns natural or artificial gas.

Has no mixer.

Automatically makes its own mixture to a perfect combustion.

Can't pop back or go out even during low pressure periods.

Will burn with flames ⅛" high.

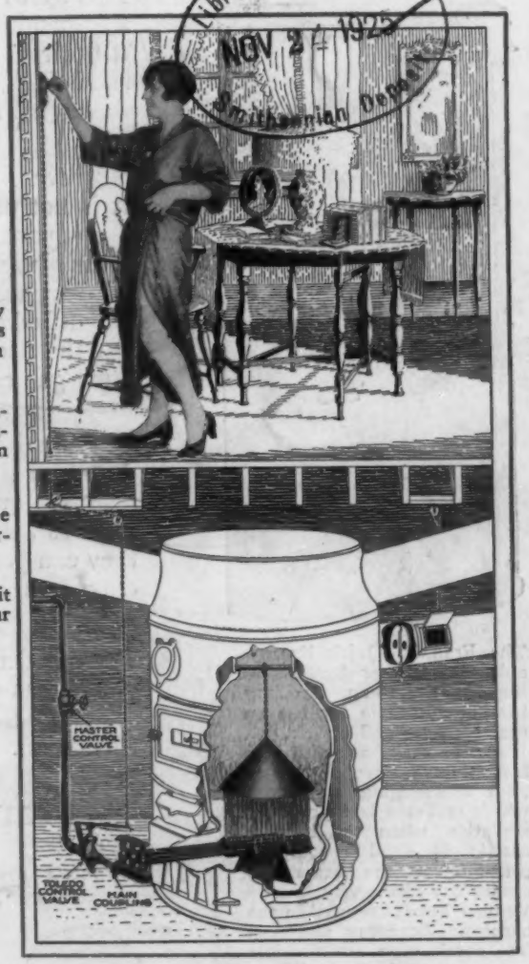
No adjustments—no odors—no dirt.

Toledo gas valve operates by pull chain from living rooms or can be operated with thermostatic control.

By-pass in valve makes it impossible to turn gas completely out from living-room control.

After burning, baffle may be wiped with your handkerchief without soiling it.

Made in one to sixteen unit outfits with one to four valve control.



At the right is illustrated the Toledo Automatic Gas Burner and the Control which operates the Toledo gas valve. By-pass in this valve makes it impossible for gas to be completely shut off from control device. With flame turned down to ⅛" high, it will not go out even during low pressure periods. Automatically making its own mixture to a perfect combustion, it will not pop back. Burners being furnished in unit outfits with multiple valve control makes possible the use of as many units as the weather requires without heat waste.

The Hall Mfg. Company

1600-06 Woodland Ave., Toledo, Ohio

Toledo Automatic Units are made for Hot Air Furnaces, Hot Water and Vapor Systems, Gas Logs, Steam Boilers, Soldering Iron Outfits, Round Type Hot Water Heaters, Industrial Applications, etc.

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FRANKLIN *Quick Removable* GAS BURNERS

Give Better Heat at Least Cost!

The coal strike is still with us. Colder weather is on its way—in some localities zero has been already reached. Solid fuel is becoming more costly and harder to secure. This is the GASMAN'S BIG DAY. Sell FRANKLIN QUICK REMOVABLE GAS BURNERS for comfort, for convenience, for profit!

The Franklin Quick Removable Gas Burner System, as illustrated, is an auxiliary heating appliance for use on coal furnaces and boilers. It can be easily attached in a few minutes' time. Equipped with a swinging stop cock which makes a leak-proof installation when the burners are in use, and a complete shut-off when the burners are swung out of the way. Venturi Tubes are used in the burners. Economy and perfect combustion are possible under any and all conditions without air mixer regulation. Varying gas pressures will not affect the burner, cause it to backfire in the mixer, or go out under low pressure.

Don't let this great opportunity slip by! Now, if ever, is the gasman's chance to convince the public that it can, if it desires, divorce itself forever from the dependence on solid fuel by burning gas economically and efficiently through Franklin Quick Removable Burners.

However, the Franklin possesses this unique advantage. It is not necessary to discard entirely the coal-fired heating apparatus, because the Franklin can be connected up to any house heating hot water or steam boiler, or warm air furnace—which can function in its original capacity when fuel is obtainable—and within a minute's time, without the use of tools, the Franklin can be put into use to burn gas exclusively.

This dual feature has appealed to over 102,000 users of Franklin Burners as the most satisfactory form of house heating equipment. It is the easiest type to sell because it gives them gas when they want it, the use of coal when they can get it, and the two combined (gas and coal) when extreme temperatures demand it.

Try our demonstration outfit on your customers, it is convincing as a most economical and efficient house heating system. Don't delay; write immediately for further information.

Franklin Gas Burner Mfg. Co.

Vine and Mitchell Sts. **Cincinnati, Ohio**

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SIXTY-SEVENTH YEAR

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"MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS"

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Fuel of the Future--What Shall It Be?

XXVII. Heat treatment and melting of non-ferrous metals

Ismar Ginsberg

THE general subject that is being treated at the present time in this series is the application of heat in thermal processes carried out on the non-ferrous metals. In the first article on this general subject there were described some of the fundamental properties of the non-ferrous metals and alloys, as well as the general characteristics of brass, which is one of the most important of these alloys. We are now ready to proceed further with this preliminary study of the general subject and take up in some detail the art of alloying. It is necessary that the industrial gas engineer know something of the more important details of the processes involved before he can talk on the application of gas in their operation.

In general alloys are made by first melting the metal which forms the bulk of the alloy and then adding the more fusible metals to the molten mass, the former being used in the solid condition. Most of the alloys of copper are manufactured in this manner. Copper has a high melting temperature and is, therefore, melted first; then the zinc or lead or aluminum are added to the molten mass of copper and as their melting temperatures are quite low, compared with that of copper, they go into solution rather easily in the molten copper.

The Apparatus

Just as in the case of the heat treatment of iron and steel, the apparatus that is employed in the melting of the non-ferrous alloys is just as important as the fuel that is employed to supply the requisite heat. In the first place, there are the crucibles in which the melting takes place. Metals which have high melting temperatures are melted in graphite crucibles, while the more easily fusible metals, such as tin and lead, are melted in kettles which are usually made of iron. The graphite crucibles are made of graphite or plumbago which is mixed with clay and a little sand. The crucibles are generally fragile and require careful handling to prevent their breakage during the melting process and at other times in the plant.

The crucibles are heated in furnaces and the heating agents employed include not only gas and oil, but also hard coal, coke and electricity. There are a number of different ways in which the crucibles are placed in the furnaces and removed therefrom, but these are details which do not concern the gas engineer very particularly.

The Furnaces

Furnaces are employed in the melting of the non-ferrous metals, not only for heating the crucibles, but also for melting the metals themselves without the aid of crucibles. The furnaces are of many types of construction and it is not intended here to describe them. The gas engineer must be familiar, however, with the important classes of these furnaces and for this reason the description below is limited only to a very general discussion of the most important characteristics and properties of the various classes of melting furnaces.

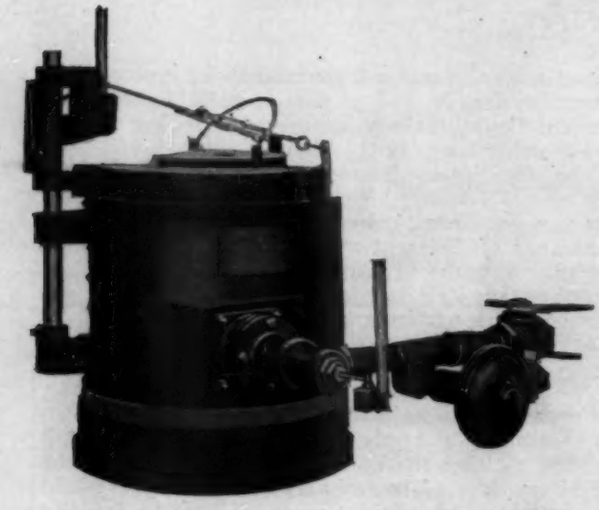
In general, the furnaces may be divided into three classes, in accordance with the nature of the firing. Thus, there are the furnaces which are fired with the aid of solid fuel, those that are fired with oil and, finally, those that employ electricity as the heating medium. Then, again, these three classes of furnaces may be sub-divided once again into furnaces which are adapted for crucibles and those in which the metal is melted in bulk. The crucible furnaces are further divided into those from which the crucibles can be removed in order to obtain the molten metal and those from which the crucibles are not removed, but which are rotated on an axis, so that the molten metal is poured out through the spout.

Melting in Bulk

The furnaces, in which the metal is melted in bulk and which employ oil or gas as the fuel, are of two types—one in which the metal is tapped and the other in which the metal is poured out by rotating the entire furnace. One such type of furnace has two compartments and while one compartment is being charged with new metal the other is melting and by the time that the charging operation is finished the other compartment is ready to be emptied. This is done by simply rotating the furnace.

The relative value of the different fuels for use in these various furnaces will be left for future discussion.

There are other furnaces which are employed for this purpose, such as the reverberatories which are used when castings of great weight are being made. Such furnaces have generally been fired with solid fuel, a soft coal which gives a long flame being used. There is one condition of firing which is important and which entails a high consumption of fuel when



Crucible Brass Melting Furnace Fired with Gas

soft coal or oil is being employed. That is, especially when melting brass, that it is necessary to maintain a reducing atmosphere in the furnace so as to avoid loss of metal. The zinc in the brass would be volatilized very rapidly and the loss would be very expensive indeed if an oxidizing atmosphere were maintained within the furnace. So the coal or oil is burned in such a fashion that a smoky flame is obtained. This, of course, means that the carbonaceous fuel is not being burned completely and a considerable portion of the fuel is thus absolutely wasted. Furthermore, there is always present the difficulty of maintaining these proper conditions within the furnace.

Gas has a decided advantage in this consideration, for it is an easy matter to secure reducing atmospheric conditions when this fuel is employed and it is a simple task to regulate this condition automatically so that there need never be any fear that the reducing atmosphere can be secured with gaseous fuel without sacrificing any of the fuel or at any rate with sacrificing but very little of it.

Reverberatory and Pot Furnaces

There is a considerable difference of opinion as to the fuel economy and technical advantages that are gained with the reverberatory furnace in comparison with the pot furnace. It is not our purpose to enter into a discussion of this matter here, for it falls quite without the province of the gas man. Nevertheless, he should know something about the relative efficiencies of these furnaces, as he may very well meet them both in his travels around alloy melting and non-ferrous metal treating plants.

It is claimed that the fuel consumption of air furnaces, that is, reverberatory furnaces, in the melting of brass, varies from 50 to 75 pounds of coal per hundreds pounds of the metal. In the case of the natural draft, hard coal, crucible pit furnaces, the coal consumption per hundred pounds of red brass varies from 50 to 95 pounds, while the coke consumption for the same furnace ranges from 67 to 83 pounds per hundred pounds of the same metal.

Design of Furnace Important

It is, of course, understandable that the manner in which the furnace is designed will have a great deal to do with its efficiency and with the economy of fuel consumption. This applies to all kinds of furnaces, no matter what may be the character of the fuel used. Furthermore, there is always present the factor of the manipulation of the furnace. This is the human element which is introduced into every heating process. It really is a fact that it does not make much difference at times just how efficient the fuel may be or how well-designed the furnace in which it is employed. When inefficient operators are permitted to run the apparatus, even when most of the factors involved are automatically controlled, proper results will not be forthcoming. It is necessary that the trinity of conditions applying to a heating operation be fulfilled in every case and with every degree of care in order that the heating operation be carried out in the proper manner. Thus the fuel must be efficient, the furnace must be well designed and the labor required to operate and tend it must be intelligent.

Electric Furnaces

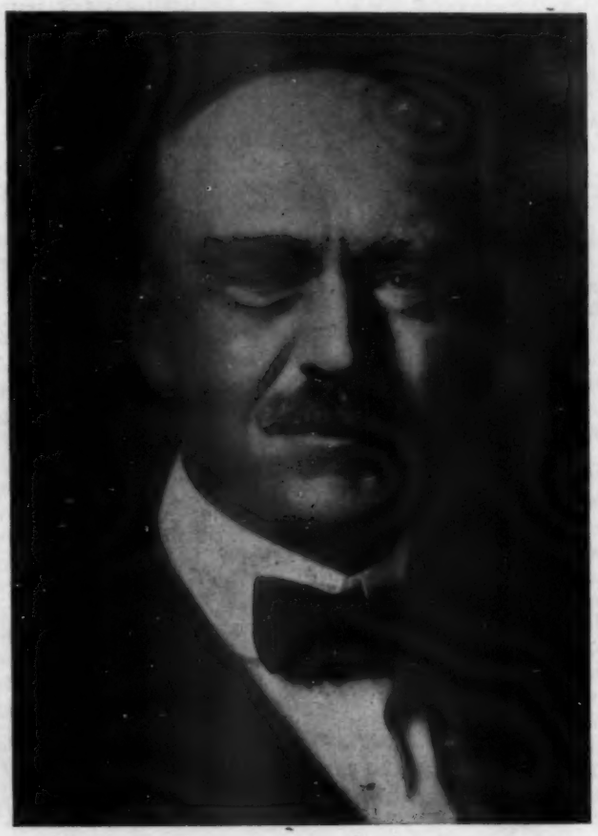
A word must be said regarding electric furnaces, for they are the real competitors of gas furnaces in this field. Electricity has striven with might and main against the odds of a high-priced fuel to gain a foothold in this business and that it has acquired it is due to the ingenuity of the electrical engineers who have designed very effective furnaces for this purpose. That these furnaces are efficient cannot

(Continued on page 575)

Public Ownership Vital to Public Welfare

Henry M. Brundage answers criticisms of important financial movement

HENRY M. BRUNDAGE, first vice-president of the Empire State Gas and Electric Association, and a vice-president of the Consolidated Gas Company of New York, at a meeting of the Bankers Institute, Utica, N. Y., made a vigorous retort to Prof. W. Z. Ripley of Harvard University, who last October delivered an attack upon the methods of corporate financing and the present-day tendency toward the wide diffusion of the ownership of public utilities and other corporate enterprises through the ownership of stocks and bonds by employees, customers and small investors. Mr. Brundage said that Prof. Ripley saw "all American business as honeycombed with dishonesty and greed and all executive management as fraught with irresponsibility, indifference, and worse. The views of his distinguished colleague in the Harvard faculty (referring to Prof. Thomas Nixson Carver of Harvard, who last March, before the Academy of Political Science, characterized the present-day corporation methods as an "economic revolution" of the most desirable and far-reaching character) were berated and rejected with a violence of invective and an indiscriminateness in denunciation that would make a Socialist party orator blush for shame." Mr. Brundage then referred to this statement made by Prof. Ripley: "Under the new style of corporation, new preferred stocks are sold up to the hilt of the value of the assets, if not beyond. The issues are called preferred stocks. They are really bonds. And instead, as formerly, of being limited to a half or two-thirds of the tangible assets, no limit is now set, except the powers of absorption of the investing public. Every kind of business is being swept into this maelstrom. All of our public utilities, except railroads, * * * every conceivable article, of direct or indirect consumption, is covered by the change."



Henry M. Brundage

A Dangerous Arraignment

Replying to that statement, Mr. Brundage said: "This sweeping statement is either true or false, as made. If untrue in substantial particulars, then Prof. Ripley is guilty of using the traditions of a great institution of learning to spread a false and exaggerated impression of American business—the kind of propaganda on which demagoguery and communism feed. Now, is his assertion true as to 'all of our public utilities, except railroads,' and as to 'every kind of business in America'?

"I know that it is not true at all, or as to many of our public service corporations," Mr. Brundage said, "and as to American industry generally, I believe there is less foundation today for such allegations than at any previous time since the corporate form of ownership came into common use."

"The Monopoly of Gas"

Further in his speech Mr. Brundage said: "Undoubtedly gas and electric companies are and should be monopolies of the business of selling gas and electric current in the territories in which they operate. They do, however, compete with substitutes. Gas for heating and cooking competes with coal and oil. As an illuminant it competes with kerosene, acetylene and candles. Central station power competes with steam and water power. The necessity of finding new uses for the off peak load of central electric stations has resulted in the use of a multitude of appliances which have been devised and popularized for that purpose."

(Continued on page 574)

The Essentials of House Heating*

Interesting details of important gas application are discussed

Major W. E. Stark

Research Engineer, Bryant Heating and Manufacturing Company

(Major Stark opened his talk by calling attention to the universal use of gas as a domestic fuel in the natural gas regions as long as there was an abundant supply of gas. As it failed and the supply was reduced in quantity in certain regions people went to considerable inconvenience to use gas. He told of his grandmother in Indiana getting up at midnight to start baking bread in order that she might have all the gas needed, since others would not be using it to the extent they would in the day time.)

IN the East it is only recently that the gas man has gotten out of the habit of looking around to see if anybody is listening before whispering the words "house heating." Of the two the producer was more fearful of house heating than the consumer. The consumer is so easily converted to the idea of heating his home with gas that he may fall a ready prey to the seller of gas burning appliances of questionable character and of burners that are guaranteed to make a good gas boiler out of a poor coal boiler.

Conversion Jobs Unsatisfactory

Conversion jobs are not satisfactory because of the difference in the characteristics of coal and gaseous fuels. A coal fire is incandescent. It is a mass of glowing coke and the flame is made up of incandescent particles of carbon. The bed of coke and the flame both radiate heat to a great degree. A cast iron heating surface will absorb radiant heat much more rapidly than it will convected heat. Therefore, the surface that can "see" the fire is particularly efficient. A good coal boiler has just enough heating surface that cannot "see" the fire, but must absorb converted heat by direct conduction so that the products of combustion are cooled down to the minimum permissible temperature, that will produce draft enough to pull the air for combustion through the grates and the bed of fuel.

A gas fire has very little radiating power. It is blue in color and there is very little incandescent matter in it. If a burner that burns with a blue flame is put into an ordinary coal-burning appliance there is practically no heat transmitted by radiation. The heat-absorbing surfaces that can "see" the fire do not absorb heat much faster than the surfaces that cannot see the fire. Therefore, when gas is burned in an appliance designed for coal, the average rate of heat absorption is much less than when coal is burned in the appliance. The result is lessened capacity and also a much higher stack temperature than is necessary.

Liberal Amount of Heating Surface Required

The requirement of burning gas efficiently is a liberal amount of heating surface. This can be obtained, though, without building in a huge weight of cast iron, because the passages for products of combustion can be made thinner than in a coal boiler. If the gas passages in a coal boiler were made as thin as in a gas boiler the draft loss through them added to that through the fuel bed would become excessive.

Tests at the Bureau of Mines on a coal boiler burning anthracite coal give as typical results with a combustion of 6.1 pounds of coal per square foot of grate per hour an efficiency of 61.3 per cent, stack temperature of 748 degrees and a draft loss of 0.099 inches of water. A good gas boiler will operate at rating with a stack temperature of 260 degrees, an efficiency of 74 to 85 per cent and a draft loss of not more than 0.01 inch of water.

This shows the impracticability of changing a coal burning boiler to a gas burning one. A gas company that is going in for house heating might as well start it whole-heartedly insisting on appliances that are built for gas and gas only. The company that tolerates conversion is going after the business in a half-hearted manner, is increasing peak load consumption and is giving encouragement to the bogey of load factor.

Cost of Heating Not Correctly Considered

It is unfortunate that the user of fuel for heating always thinks of his heating costs in terms of the first cost of the fuel. When gas is used the cost of the fuel comes very close to being the total cost of heating, but when solid fuel or even oil is used the first cost of the fuel is only a part of the heating cost. There are so many intangible savings due to the use of gas that cannot be evaluated in dollars and cents, such as elimination of destructive effects of ashes, soot and smoke on home furnishings and in health that an estimate of fuel cost is grossly misleading. However, a few figures on cost of gas for house heating may be interesting.

There are two variables that enter into the fuel cost when heating a house with a gas-fired steam or hot water boiler. They are, first, the duration and intensity of the heating season, and, second, the amount of radiation supplied.

The Duration of the Heating Season

The most convenient expression of the heating season is the degree day devised by the American Gas Association. The average user of gas heat runs his heating plant during those months in which the average temperature falls below 65 degrees. Therefore, 65 degrees is taken as the datum line and a degree day is defined as a day on which the temperature is 64 degrees, or one degree below 65 degrees.

*Delivered at the November meeting of the Industrial Gas Association of New England.

The difference between 65 degrees and the average for the month multiplied by the days in the month gives the degree days for the month. The summation of all the months in the heating season gives the degree days for the year. The average heating season for Boston has 6,150 degree days.

The most convenient unit for expressing the radiation load in the house is the square foot of equivalent direct radiation. By taking the gas consumption figures of a large number of installations scattered over the entire country it is possible to obtain a figure that will give the cubic feet of gas per square foot of radiation per degree day, or better the B.t.u. supplied in the form of gas per square foot per degree day.

Heat Put Into Boiler

We find that the heat that must be put into the boiler in the form of gas per square foot of steam radiation per degree day amount to 102 B.t.u., while for water it amounts to 58.6 B.t.u. per square foot per degree day. To find the gas consumption for a season we would multiply these factors by the square feet of radiation and by the degree days of the heating season and divide by the heat content of the gas.

For Boston we have:

$$\text{Steam } \frac{102 \times 6{,}150}{528} \text{ equals } 1{,}188.$$

$$\text{Water } \frac{56.6 \times 6{,}150}{528} \text{ equals } 683.$$

These factors are obtained by averaging a large number of installations. They represent the results obtained by consumers who wasted gas and also by consumers who cut the corners everywhere they could. Over-radiated and under-radiated houses are included. It is readily possible for any individual consumer to use less than would be indicated by these figures and still be perfectly comfortable.

Gas Heating System Most Flexible

A gas-heating system is the most flexible there is. It responds quickest to demands for heat and so is worthy of good controlling devices. Thermostatic regulation is easily applied and will soon pay for itself in the savings on the gas bill. Of course, on a steam-heating installation the usual pressure control is virtually a necessity, in addition to the room temperature control which is highly desirable, while on a water job control of water temperature as well as room temperature is quite advisable. Water temperature control permits of varying the water temperature to suit the weather, thus aiding the room thermostat in keeping the temperature uniform by reducing the amount of heat stored in the system in mild weather. It also prevents the water from boiling.

The usual gas boiler has a number of burners which can be individually controlled manually. The owner can if he desires leave all the burners of his boiler turned on and depend on his controlling devices to shut off the boiler when the temperature or pressure reaches a certain point. This is easy for the owner, but it increases the gas bill a little. It is most economical to try to cut burners off in accordance with the weather, the object being to cause the controlling devices to function as few times during the day as possible. This makes the control devices more as limiting devices. A boiler operates more economically when a few burners are on all the time than when all of the burners are on part of the time.

Secondary Air Controls

Such devices as secondary air controls can be put on boilers and will wipe out a little, but only just a little, of the loss due to intermittent operation. They cannot take the place of manual control. The savings effected by secondary air control are so small that if by any chance the control failed to work eight days' savings would be lost in one hour under average operating conditions.

A few figures to show what good building construction, especially weather strips, amount to when translated into gas bills may be interesting. However, it is not well to harp on construction to the prospective gas user because it gives him the impression that gas is a lot more expensive than it actually is and that he will have to spend a lot of money to keep from having extremely high bills.

Some Interesting Figures

Tests made by the Society of Heating and Ventilating Engineers show that an ordinary window with 1/16 in. crack around it, locked at the meeting rail, with a sash perimeter of 15 feet 8 inches, exposed to a 15-mile wind, passes 50 cubic feet of air per minute. The same window weather stripped passes 10 cubic feet per minute. This gives a difference of 40 feet per minute between weather stripped and unweather stripped windows. With zero weather and 70 degree indoor air, this would amount to a heat loss of 3,440 B.t.u. per hour. With a heating appliance of 80 per cent efficiency and 550 B.t.u. gas such a window without weather strips would account for 7.82 cubic feet of gas per hour that might be saved. Ten such windows in the course of 24 hours would waste 1,876 cubic feet of gas, amounting to a loss of 16 to 17 cents per window per day.

Competition with Electricity

There is nothing to fear from electricity as a heating agent, though the gas man will have to watch it. House heating by electricity has an attractive sound, but some simple calculations give it a different complexion. Assume, for example, a house with 500 feet of steam radiation. The maximum demand would be 500 times 240, or 120,000 B.t.u. per hour. This is equivalent to 35.2 K.W. The installed generating and distributing capacity would cost at the rate of $200 per K.W., $7,040. Fixed charges of

(Continued on page 577)

The Gas Plant and the Gas Made*

Types of plants and quality of gas best suited for the development of the gas industry

J. A. Perry

The United Gas Improvement Co., Philadelphia, Pa.

DURING the past ten years we have witnessed a large increase in construction costs for public utility improvements of all kinds.

The great fluctuations in the cost of oil for gas manufacture, with unstable and changing rates, the possibilities of large demands due to the taking on of house-heating customers, together with other and equally serious problems, have caused a feeling of uncertainty among many of the men prominent in our industry as to permanency of our present types of gas manufacturing apparatus.

The question naturally arises under present conditions:

Are we going to face new and more economical processes, which will scrap our present plants, or can we plan with confidence our works developments with existing types of gas manufacturing plants, and economically and satisfactorily fit them in with future processes of gas manufacture, or with processes of manufacture that are now undergoing the first stages of development?

With this thought in mind we must first consider the changes, if any, that must be made in the heating value and other characteristics of the gas to make possible the handling of the extreme variations in daily output, due not only to large variations in the heating load output, but also to more satisfactorily handle our existing business which, in many instances, varies greatly in daily output through the year.

Quality of Gas

The heating value of the gas must be as reasonably high and uniform as is economically possible, bearing in mind the necessity of keeping down the investment cost for boosters, mains, services and meters, as well as the extra cost of pumping out the larger volumes of lower heating value gases.

The gravity of the gas should be fairly uniform throughout the various seasons of the year. It matters not so much as to how the gas is made up for the supply for the various seasons—whether of coal gas, carburetted water gas, oil gas, producer gas, etc.—so long as the final gas as sent out is of a fairly uniform specific gravity.

Base and Peak Gas

The base gas, or gas used throughout all seasons of the year, should be made from raw materials of which the major portion is likely to maintain at a uniform as well as at a low cost throughout the future.

The base gas, and all other gas, should be of such a quality and gravity that peak loads can be supplied with a different kind and type of gas of substantially the same heating value and gravity.

The major portion of the peak load gas and heating gas for cold weather use should be made on apparatus capable of producing large volumes on short notice.

Such peak load apparatus of necessity must be reasonable in cost, or the carrying charge will be too great to justify the handling of this business.

Owing to the extreme fluctuations in the cost of gas oil, as shown by our past experiences, and the probability of still higher oil costs throughout the future, the quantity of oil used in any gas manufacturing process should be limited to as low an amount per unit of 1,000 cubic feet of gas as is found possible.

The foundation for the base gas, especially for that portion of the United States east of the Mississippi River, should be coal gas, say of 570 B.t.u.

All other gas to complete the making of the base gas and for foundationing out the peak gas should be processed with the use of coke.

How to Secure Uniform Quality and Specific Gravity of the Gas

Assuming that, when the house-heating business is fully developed, the peak load or daily send-out during the heating season may reach from three to four times the average daily send-out per day of the summer time, or even greater, the problem first is to modify the quality of the foundation for the base gas, both as to its heating value content and its gravity, so that it will be of the same quality and gravity as the gas used for taking care of the extreme send-out conditions.

Carburetted water gas has a much higher gravity than coal gas of the same quality. Blue gas, as usually made from coke or anthracite coal, has a higher gravity than coal gas. Producer gas has a higher gravity than any of the other gases except the oil gas as made and used for carburetting blue gas.

If the foundation plant for the base gas—viz., any good type of coal gas manufacturing plant—is equipped with central coke-fired producers, we have at hand a cheap gas manufacturing apparatus producing a gas of about 130 B.t.u. and a gravity of about .9, which can be used for mixing with the foundation 570 B.t.u. coal gas for reducing the quality of the gas and for bringing up its gravity to the same point that may be required for the peak gas.

An Example

For instance, if we assume that 570 B.t.u. coal gas, with a gravity of .43, is mixed with 130 B.t.u. producer gas having a gravity of .90 in the proportion of 70 per cent coal gas and 30 per cent producer gas, the mixed gas would have a quality of 438 B.t.u. and a gravity of .57;; or, in round figures, we might say that this base gas which could always be produced

(Continued on page 578)

*Presented at the Tuesday, October 13th, meeting of the Technical Section of the A. G. A., 1925 Convention.

INDUSTRIAL GAS LESSONS

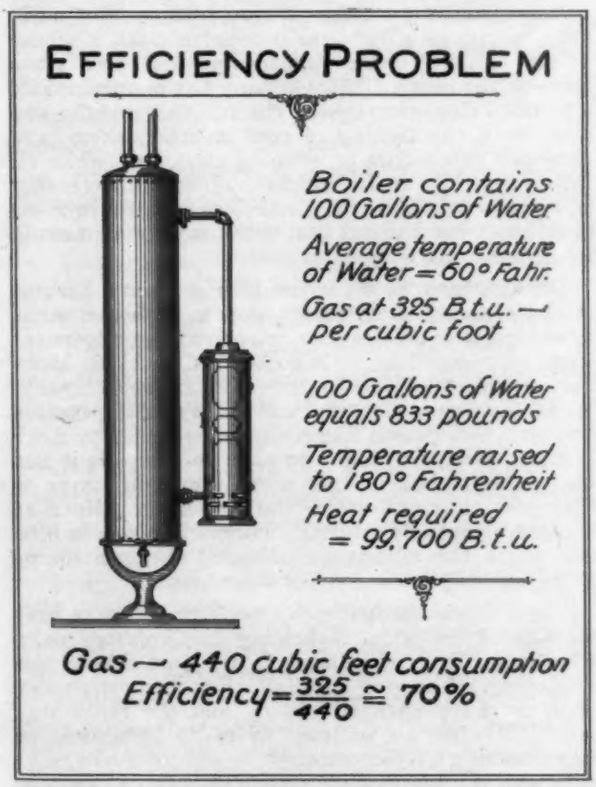
IF IT'S DONE WITH HEAT — YOU CAN DO IT BETTER WITH GAS

Lesson No. 95

Heat and Change of State

THERMAL EFFICIENCY

The efficiency of any apparatus is simply a ratio. The efficiency of a steam engine, for example, is the ratio of the energy that is put into the apparatus to the energy that is derived from it. The same is true of an electric motor. Thus the thermal efficiency of a furnace simply means the percentage of heat effect actually obtained by burning the fuel in the apparatus. When the heat output is divided by the heat input, a ratio is obtained which, when multiplied by 100, will give the percentage efficiency of the apparatus.


EFFICIENCY PROBLEM
Boiler contains 100 Gallons of Water
Average temperature of Water = 60° Fahr.
Gas at 325 B.t.u. — per cubic foot
100 Gallons of Water equals 833 pounds
Temperature raised to 180° Fahrenheit
Heat required = 99,700 B.t.u.
Gas — 440 cubic feet consumption
Efficiency = 325/440 ≅ 70%

An Example

What is meant by thermal efficiency may be better understood from an example. Thus, take the ordinary form of water heating apparatus in which gas is used as a fuel. The tank of water contains 100 gallons, for example, and its temperature is originally 60 degrees F., which is raised to 180 degrees F. The gas that is employed in heating up the water is a water gas of 325 British thermal units per cubic foot. This means that every cubic foot of the gas contained 325 B.t.u. of potential heat energy. This energy is contained in the gas in the form of chemical energy and is released when the gas is burned in the form of heat energy. It is this heat energy that raises the temperature of the water from 60 to 180 degrees F. Furthermore, this energy is liberated from the gas if it is burned completely and only under such conditions.

Heat to Effect Temperature Change

First of all, what is the heat energy that is required to effect the temperature rise in the mass of water? This is found in a simple manner by the following calculation:

$100 \times 8.33 \times (180-60) \times 1$, or 99,960 B.t.u.

This means that 99,960 B.t.u. of heat energy must be absorbed by the water before the particular temperature rise can be secured. Then inasmuch as each cubic foot of the gas will generate 325 B.t.u. in combustion, the number of cubic feet of gas that is theoretically required for this operation will be found as follows:

$$\frac{99{,}960}{325}, \text{ or } 307 \text{ cubic feet.}$$

But it is found from actual practice that more gas than this was consumed, for example, 440 cubic feet of gas were consumed. Now the heat contained in this volume of gas is 440×325, or 143,000 B.t.u. In other words, this is an excess of 43,300 B.t.u.

Where Did the Heat Go To?

The question then arises, where did this additional heat go to? What has become of it? Has it been lost? Our knowledge of the conservation of energy tells us, no. This heat has not disappeared. Of course, it has not done the work that was required of it, but it has not been destroyed. It has simply been dissipated.

This heat has been led away by the various agencies that transport heat, such as conduction and radiation. It has been radiated into the air surrounding the hot water boiler and has been conveyed by conduction into the metal parts of the apparatus. Furthermore, the heat in the gas was present in the chemical condition, or rather in the form of chemical energy which had to be liberated by the combustion of the gas. Hence some of the heat was undoubtedly not set free, but went up the stack in the form of flue gases which were not completely burned. Thus it follows that in all heat work certain losses are inevitable and any heating operation is never 100 per cent perfect. Hence we speak of the efficiency of a heating operation or of a heating apparatus.

Calculation of Efficiency

In this case it is a simple matter to calculate the efficiency of the apparatus. We know the heat put into it and the effective work done by that heat or the heat output. Thus by dividing 143,000 B.t.u. by 99,960 B.t.u., we obtain that the efficiency of the apparatus was practically 70 per cent. This means 30 per cent of the heat in the gas, the potential heat value of the combustible, was lost. This amount of heat was lost both through the incomplete combustion of the gas (only a small part of the heat is wasted in this manner) and through radiation and conduction losses which are dependent on the manner in which the hot water heating installation is constructed.

Laclede Cultivates Future Home Managers

Advertisements directed to girl scouts

William H. Matlack

Teach them to cook and they will cook with gas. That is the big idea back of the Laclede Gas Light Company's policy to train every future home manager whose attention they can gain via radio, direct advertising, show window and newspaper advertising.

Girl Scouts' Night
—at—
Laclede Home Service Auditorium
with a
CAMP COOKERY MENU
On Monday night demonstrators of the Home Service Department of The Laclede Gas Light Company will teach a menu of delicious foods which can be prepared and served at home or under the difficult conditions of camp cooking. This will be done again at intervals.
THE MENU—(At 7:15 P. M. Monday, Home Service Auditorium, Laclede Gas Building, Olive at Eleventh:
Broiled Chops
Corn Souffle
Baking Powder Biscuit
Cucumber Relish
Pineapple Skillet Cake
All of the cooking classes of this department, at 2:00 p. m. every week day but Saturday and also at 7:15 p. m. on Mondays, are free, and all are invited. To the class next Monday night Girl Scouts especially are invited
Home Service Department
The LACLEDE GAS LIGHT COMPANY
Olive at Eleventh
Central 3300
Listen to Our Home Service Talks Broadcasted From Radio Station K. S. D. at 10:00 A. M. Every Week Day

Aside from the window demonstrations, this company maintains a daily radio cooking class, a school in the Home Service Auditorium, and does some work in the home. The company has maintained an afternoon class throughout the summer months and now, with the coming of cool weather, they have arranged to conduct an evening class, and while all instruction has as its ultimate object the creating of more converts to the smokeless fuel, there is no preaching on the use of gas, nor is any attempt made to sell during demonstrations.

To illustrate how far afield the Home Service goes to secure and train prospective home managers, users of gas service, glance at the advertisement reproduced here. Who but a Charles A. Monroe, president of the Laclede Gas Light Company, would sanction a plan that called for cooking classes to teach Girl Scouts Camp Cookery—but why not? If these girls are taught to cook in camp, is it not reasonable to believe that when they get homes of their own they will utilize the knowledge gained at the gas company's school? They will also come to appreciate the advantage of using modern equipment and will demand it for their homes.

The Laclede company, by such progressive and far-sighted methods, is helping the industry as a whole, and it is very hard to tell just where the seeds they are sowing may fall. For the newspapers they use have wide circulation and the radio station, KSD, has an audience of many thousands in every section of the country.

To say the least, the Laclede company has taken a step forward that will stimulate better cooking and the use of better gas appliances over a broad area. There can be no doubt that its efforts will be highly effective in selling gas and gas appliances and in strengthening favorable public opinion in St. Louis.

As The Journal Views It

THE GAS MAN'S OPPORTUNITY

In a recent issue of The American Gas Journal there was published an article in which the attention of gas men was sharply called to an opportunity which, it does not appear, they are making the most of. What was referred to was the hard coal situation throughout the country, and particularly in the New England and Northern Atlantic States in the East, which has resulted in the disappearance of practically all supplies of hard coal from the market, and the necessity of using substitute fuels in place of anthracite, which has held supreme position, as a house-heating fuel, in these localities.

The situation has really become a very severe one. So much so that restrictions on the use of soft coal have been removed in various Eastern states, so that, even though the atmosphere may become quite smoky, nevertheless, the people might not be forced to freeze. However, it is strange to see—and perhape it should not have been unexpected at all—that a user of anthracite does not take kindly to the use of soft coal, even though he will not have to pay as much for his fuel. Furthermore, as is well known it is a much more difficult matter to keep a fire going in steam heat or hot air furnaces with soft coal and those who have been wasting anthracite know practically nothing at all of how a soft coal fire should be controlled. In fact, certain reports have stated that the soft coal fire gases have been allowed to spread through the house, resulting in a great inconvenience to the occupants and in some cases in partial suffocation.

It appears, however strange it might be, that an industry is actually committing suicide. There is no question at all but that the public has gotten very tired of the way in which the anthracite industry and the anthracite coal miners regulate their affairs. It has gotten tired of having to pay high prices for its fuel and having to suffer coal shortage when there is absolutely no logical reason why such a state of affairs should exist. The public is at present in such a state of mind that it would welcome gas as a house-heating fuel even though the cost of gas house-heating might be a little more than that entailed by the use of anthracite at $25 a ton.

This is the gas man's opportunity. He has a chance now of selling gas for house-heating, an opportunity which is greater than at any time in the past. He has learned considerable about the characteristics of the house-heating load and about the merchandising features that are involved in this new field. If he goes after the business he is bound to get it, for in those cities where the gas rates are moderate or where the rate structure is such as to allow a special concession to those who use gas for house heating, the differential between the cost of gaseous fuel and hard coal has been reduced to such a point that it is no longer of consequence.

The gas man must realize that his field is the heating field, that his fuel can and must be used wherever heat is required. He must develop the heating field, in the same manner in which electricity has developed the power and lighting field and he must dominate the heating field or else eventually give way entirely to another fuel. There can be no half-way measures which will be safe. Either gas drives out all other competitors—and it certainly can do so—or else eventually it itself will be driven out.

In the present condition brought about by the anthracite coal strike, there is afforded gas a splendid opportunity to secure a strong hold on the house-heating business. Anthracite coal users will not take to soft coal, as has been very clearly demonstrated in the last few weeks. Oil itself is not a proper fuel for house heating, for it possesses a great many disadvantages. Electricity cannot be used. Therefore the field for house heating is opened to gas. It is true that under certain conditions it would be more advisable for the gas company to combine the use of both oil and gas in house-heating installations but this system also employs the use of gas in large quantities for house-heating apparatus.

The gas man should make the most of this opportunity. He may never have such a chance again. Everything appears to be right for the development of gas into the supreme house-heating fuel. And if the gas industry sets out in a spirited manner to corral this business it will gain a strong foothold which will enable it later to develop the house-heating business to the point that it eventually should and must attain.

Women's Work and Home Service

Service works aids in creating homes

Ada Bessie Swann

THEY say! What's worrying me just now is the things they say about women.

They say women are not what they used to be, that the ancient and honorable profession of housekeeping, the oldest in the world, has perished from the earth, that women aren't interested in housework, cooking, cleaning, washing and ironing.

They say that jazz, clubs, golf, rolled stockings, bobbed hair, careers, cocktails, cigarettes are diverting the feminine mind from the old-time womanly occupations of cooking and cleaning, raising babies and loving husbands. .

Bosh!

And I say, in a good old-fashioned word—Bosh!

The only new fashion I like about it is to change that word housekeeping to homemaking.

It is true women have demanded and taken privileges which were withheld for many generations, but that was to be expected, having minds to think with they thought and demanded.

But God gave women a permanent characteristic of the womanly makeup. It's never been changed. never will be and is not found in men, because God did not fashion them so.

The ruling desire of every woman's heart is to be necessary to the happiness of those who make up her family, her husband and children. If she hasn't any husband or children, this is the prime desire of her heart just the same.

Women Then Are Happy

Women are happy only when this desire is being fulfilled.

The activities and occupations that grow from this desire take various forms, but the desire is the same.

The ambitions to progress, the desire for breadth of intellect and experience exist, of course, but they exist as a secondary emotion to the fundamental one mentioned.

Women would rather create perfect homes for their families than to do other jobs, if they had to choose. Their ambitions are such that they do not want this choice thrust upon them; they want freedom to create perfect homes AND to have some other interests and occupations.

Reason for Home Service Interest

This is the meaning of the intense interest by women in the Home Service Departments of gas companies, in its daily teaching of new and easier methods for doing the old-time so-called drudgery of the home.

Women have rebelled against the amount of hard labor that was formerly required to satisfy their own heart's desire, with which they were created and which they couldn't escape if they wanted to, because labor left no room, no time and no strength to permit them to respond to their other desires and ambitions which, although secondary, still got pretty insistent at times. It is this rebellion that has so upset the critics.

Industry and manufacture know that women will always create and maintain homes, and so factories, industries are daily turning out appliances and power for the new home, the freer women.

But this supply of power and of devices is not being used by women as fast as they should. This is only because they do not know the service they render. Having spent generations learning the art of housekeeping, they can scarcely be expected to accept these new labor-saving appliances without being shown and told.

Home Service Departments in gas companies have this mission to fulfill. If, instead of lamenting and saying that "women no longer want to cook, wash, iron and create homes," they will teach the new, the easy methods that genius and science has developed for us, then the women will cook, healthy bodies will be built, perfect homes created, and last, but not least, the gas meter will spin around many times a day and labor-saving appliances will be installed.

N. Y. CITY GAS COMPANIES READY FOR COLD WEATHER

The gas companies which serve the six and a half millions of Greater New York have discounted the coal strike and are ready for the first cold snap and the sudden upward leap in the demand for gas that it will bring, says the New York State Committee on Public Utility Information.

A demand for gas service equal to or exceeding the records set two years ago in the last coal strike has been foreseen. Coal in sufficient quantities to supply any probable requirements has been laid in, with additional stocks of gas-fired heating devices and other household appliances which may be called for by the public.

Using the unprecedented demands of two years ago as a basis for present estimates, both the Consolidated Gas Company and its affiliated utilities and the Brooklyn Union Gas Company, which has materially increased its production capacity, are prepared to meet any requirements the public may make for service during the coming winter.

GAS IN OXYGEN TORCH

A very successful operation in repairing at the headquarters shops of the California Highway Commission at Sacramento, which saves considerable expense, is the filling of wrist pin scores in cylinders. The success of this was demonstrated some time ago, when a motor truck block that had been filled several months previous was accidentally run low on oil enough to score the cylinders and pistons, but the score fill stayed in. The score fill metal is put in by a small torch, which burns city gas with oxygen. The metal is made of lead, tin and a small percentage of copper.

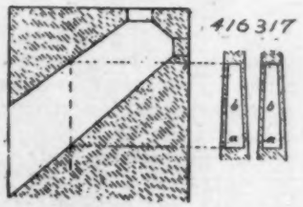
PROGRESS IN GAS TECHNOLOGY
Domestic and Foreign

COMPLETE GASIFICATION PROCESS

THIS process is of the kind in which coal is carbonized by internal heating, and the resulting coke used for the production of water gas. The coke is subjected to an air blast, and the gases are led, without passing through the coal, through recuperators. The heat stored in the latter is used for super-heating steam, which is used for carbonizing the coal alternately with hot water-gas produced by steaming the coke. Alternatively, after the recuperators aer heated, the air blast is continued and the blast gases passed through the coal, thus helping to carbonize it. The resulting gases are stored. British Patent No. 239,280.

INCLINED RETORT OVEN

THE side walls a, of the coke chamber b, are inclined toward one another, as may be seen from the accompanying illustration, with the result that the vertical section of the chamber has the form of a trapezoid. On the other hand, the horizontal section through the coke chamber has the form of a rectangle. This form of construction of the coke chamber gives a trapezoidal form to the coke cake that fills the chamber. The result is that when the door of the retort is opened it is possible to remove the coke cake without any difficulty. The furnace is also made so that the heating space between any two chambers has a horizontal section which is also in the form of a rectangle. The baffle arrangement within the heating space is made in such a manner that a regular distribution of the flame is obtained.



The apparatus is patented in German patent number 416,317.

NEW GAS WASHING MACHINE

IN a recent article published in the German Journal Zeitschrift fuer angewandte Chemie, 1925, volume 38, pages 626 to 629, there are described the results of experiments that were made with compounded absorption media in the washing of gas. The combination of cycle-hexanoles and naphthols was found to have no particular technical advantages. Similarly, the addition of phenol had no favorable action on the absorption of the benzine hydro-carbons by tetrahyranaphthalene. Tetralin is particularly to be recommended for the absorption of benzol hydrocarbons.

HEATING VALUE AND USEFULNESS OF GAS

THIS is the title of a publication issued by the Bureau of Standards, as Technologic Paper number 290.

The report is divided up into five sections. In the first section there is contained a description of the sources and discussion of available information on the subject. There are two classes of data: 1—Direct observation of the useful effects obtained from the utilization of gases of different qualities in the ordinary gas appliances; 2—Statistical data showing changes in the quantity of gas used, which accompany changes in heating value.

In the second section there is a summary and discussion of the data contained in the first class, while in section three general information that is given in the second section is amplified. It is said that there is a very general agreement that in all kinds of commercial appliances the potential heat of the gas is used with a substantial equal efficiency, whatever the other properties of the gas may be.

In section four there is given statistical data bearing on this subject and it is shown that the amount of potential heat used by a community, in the form of gas, does not appear to be effected by the heat value of the supply.

In the last section is a discussion of statistical data in general and the application of the established facts to standards and rates is brought out.

MAKING OIL GAS

VAPORS of animal or vegetable oils are lead over catalyzers, according to the process that is patented in French patent 581,935. The catalyzers are made in the form of discs possessing a great many perforations. These discs are fastened to a common shaft and are separated from one another by a short distance. The whole catalytic device is arranged horizontally in a catalyzing space and the temperature therein is maintained at 500 to 700 degrees C. It is claimed that this method of constructing and arranging catalyzing apparatus avoids the formation of high boiling point polymerization products which are generally obtained in the ordinary oil gas process.

GAS FROM STEAM, OIL AND COKE

ACCORDING to German patent 413,741, oil vapor and steam are thoroughly mixed together, before the mixture is introduced into the incandescent layer of coke, in a water gas generator. Then the heating of this mixture is effected in such a manner that, when the decomposition of the oil begins accompanied by cracking and precipitation of carbon, the steam which is required for the gasification of this precipitated carbon is present in the generator in undecomposed state and in sufficient proportion for complete conversion.

PUBLIC OWNERSHIP VITAL TO PUBLIC WELFARE

(Continued from page 565)

Mr. Brundage further said that before there was any regulation by regulatory commissions, "the prices of gas and electricity have been on a constant decline. The output and prices of the gas companies in New York City, prior to regulation, afford an excellent illustration." Mr. Brundage pointed out that in 1826 the price of gas was $10 per thousand cubic feet and that the prices continued to be reduced at regular intervals until the present time, when gas in New York City is $1.15 per thousand cubic feet.

Utility Regulation

Mr. Brundage stated that a volume of Public Service Commission rulings and court decisions has been built up in recent years, which has been of immeasurable value to the public and the utilities serving it. In this connection Mr. Brundage said: "Gradually, the practice has become standardized to this effect: that the utilities shall earn—if they can, by wise and economical management—a return of 8 per cent on their property value, that return being estimated to be the amount needed to attract new capital to provide for the ever-increasing demand. It has been established, by numerous decisions of the highest courts, that rates which will not yield a fair return are confiscatory, are therefore unconstitutional, and may not be permitted. Acts of the Legislature fixing rates too low to yield a fair return on the proved property value of utilities have been declared unconstitutional."

"The utilities, by and large," Mr. Brundage said, "have prospered under this system of fair play, and the public has benefited. It has enabled the utilities to obtain the capital to finance their remarkable growth and to improve their service, which has been brought to a very high standard. And as their service has been improved, and they have enlarged their business, they have been able to effect economies which have permitted many of them to make rate reductions. The average price of electricity for domestic use in this country is now more than 9 per cent less than it was in 1913, and Government figures show that this is the only item in the whole cost of living list which is below the pre-war price.

A Bulwark Against Corporation Baiting

"When a cry for public ownership was set up in a certain California city, the company retorted: 'What do you mean, "public ownership?" The public own it now,' and so they did, the entire stock being held locally. Political managers are slower, but not altogether without perception. Evidently, corporation baiting is not such a clever movement to gain votes when one out of seven of the population stands to lose money by legislative attack. A compaign for reduction of rates of local gas and electric companies may arouse deep resentment from voters whose dividends are in danger of reduction, especially from employees who hold preferred stock and from small investors who have withdrawn 4 per cent money from savings banks to invest in 7 per cent preferred stock. Not only does such action arouse antagonism on the part of stockholders in the particular gas and electric companies which are attacked, but also on the part of shareholders in other utilities, who feel that their turn may come next. Popular ownership tends to take the utilities out of politics, by making attacks on them less available as a campaign issue."

Demand for Service and for Capital

Further, Mr. Brundage said: "The story of the utilities is a never-ending cycle of demand for service, and demand for capital to make service possible. Ownership of the utilities of this country, represented by capital invested, has long outgrown any little group of so-called capitalists. They are owned today by the American people. The latest figures I have on the investors in the electric industry place the number at two and a half million; for the gas industry the figure is set at a million and a half. There is undoubtedly a duplication in these figures, since many companies are both gas and electric utilities; but let us say three million for the combined gas and electric utilities. This does not represent the popular interest in them, because the great mutual life insurance companies, with their millions of policyholders, have invested very large sums in gas and electric utilities. Savings bank funds in many states are invested in utility securities. The savings bank associations are advocating a law in this State to legalize investment of savings bank funds in bonds of public utilities which measure up to certain standards.

Utilities Exist to Serve All

"Public utilities differ in many important respects from the mercantile or manufacturing organization. They exist to serve all comers; and this has been true of them from the time of the communal well and its successor, the town pump, probably the first public utility. This principle is embodied in early laws and court decisions concerning ferries, wharves, packtrains and similar beginnings of public service enterprises. Furnishing their service involves a permanent investment in land, buildings, machinery and apparatus, distribution systems. Gas and electricity are made and delivered to your point of use and must be ready for use in any quantity, at any time you desire. The physical and human elements which produce and maintain the service, therefore, must be kept, not abreast, but always a little ahead of the greatest possible demand. The investment in physical properties, consequently, never lessens; it always increases."

LOST INK-MAKING ART RESTORED BY USE OF GAS

The long-lost art of the ancients in making ink that grew darker with the years instead of fading, that held its color and did not corrode, is believed to have been rediscovered through the use of the gas-heated cauldron, in which a precise degree of heat can be maintained indefinitely.

The old inks, which are still bright and clear after hundreds of years, were made of various plant juices.

An American ink manufacturer recently installed gas heating equipment for the great cauldrons in which ink is prepared. Ink made in these from an extract of blue Aleppo nut-galls is said to show the qualities of the inks of long ago. The process, parts of which are closely guarded secrets, includes the boiling of the nut-galls for two hours at a definite degree of heat.

FUEL OF THE FUTURE—WHAT SHALL IT BE?

(Continued from page 564)

be gainsaid, but it is held that the same high degree of efficiency can be obtained with a properly designed gas-fired furnace, and that the cost of fuel will be less. The regulation of the furnace will be just as conveniently and as accurately performed with the gas furnace as with the electric furnace, and the results will be just as advantageous. This field is as much the gas man's as the baking field, into which electricity has also ventured, but in which its success has by no means been so marked. The gas man must make up his mind to take the proper steps to gain control of this important industrial application of fuel and he can do so if he attacks the problems in the proper fashion. Here, again, what is called for are no half-way measures, but real intensive work and the adoption of broad methods. The field must be invaded by the gas man, properly equipped with all weapons to overcome the competitors in it, and it will not do at all to undertake this task unless these preliminary conditions are fulfilled. And it is hard to see how the gas man can fail of success if he enters this field, properly provided with all technical data relating to the processes that are carried out in it and with the properly designed furnace in which to use his fuel.

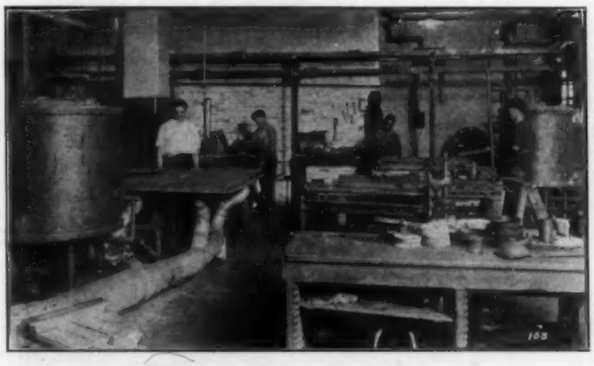
General Details of the Melting Process

When operating a non-crucible furnace it is necessary, as has been said, to pay strict attention to the adjustment of conditions so that a non-oxidizing heat is obtained. This is an important matter for if an oxidizing atmosphere exists in the reverberatory, then the hot molten metal will be changed into oxides which collect on the surface, forming a scum and causing difficulties in subsequent pouring. Furthermore, when a part of the metal is removed in this manner by oxidation it is understandable that the finished alloy will not have the composition that was desired and that was provided for in weighing out exact amounts of the individual metal ingredients before introducing them into the furnace. It is easy to see that with a fuel such as gas, which is easily controllable, it is possible to adjust the combustion conditions in such a manner that there is no excess of air introduced into the fuel mixture and that the resulting combustion gases are absolutely non-oxidizing. This can be accomplished more readily with gas than with any other fuel, for the simple reason that it is a simple matter to effect a thorough mixing of the air and of the gas and to control the amount of air added so that only sufficient is present to combine with the combustible ingredients of the gaseous fuel.

Conditions in the Pot Furnace

When alloys are prepared on a smaller scale and the crucible or pot furnace is employed, it is also necessary to take special precautions to prevent oxidation of the metals. Hence it is common practice to throw all sorts of materials on the surface of the metal so as to prevent its oxidation, by eliminating the chance of air coming in contact with it. Of course, it is necessary to use materials which in themselves have no effect on the metal. Thus an anhydrous borax is used, but while this substance offers adequate protection, still its use is surrounded with many disadvantages. In the first place, it is a comparatively expensive substance and the cost of alloy-making is materially increased when it is employed. Then, again, all borax generally contains a little free boric acid and this acid will combine with the metals to form borates, which are further combined with sodium borate to give a double salt of glassy nature, thereby entailing a certain loss of metal.

The use of glass for forming a coating over the surface of the metal seems to be free from objections. When the presence of carbon in the alloy is of no account, then it is easy to avoid access of air to the surface of the metal by covering the latter with a layer of granular charcoal. In the case of low melting point alloys it is sometimes customary to throw a little fat on the surface of the metal. The fat is decomposed, the atmosphere is mixed with reducing gases and there is deposited on the surface of the metal a fine layer of carbon, which prevents oxidation.



Circular Electrotype Gas Fired Furnace

But here again in the properly designed crucible furnace the use of gaseous fuel will be of special advantage, in that the atmosphere provided by the combustion of the gaseous fuel could be made reducing so that it would not be necessary to use various substances for covering the surface of the molten metal. At best this practice is not a very desirable one and in a properly designed furnace it would be altogether unnecessary if the combustion of the fuel is correctly controlled.

Mixing the Metallic Ingredients

A few words must be said regarding the manner in which the metallic ingredients are mixed together in the melting of alloys. It has been mentioned before that the general practice is to melt first the metal which has the highest melting point, and then, after fusion is complete, the more fusible metals are added. There are some exceptions to this rule which are due to the individual properties of the metals

used and the alloys formed. Thus it is not always possible in this manner to secure a homogeneous mixture, especially when the two metals enter into the chemical combinations with one another or where the specific gravities of the metals are very different.

Another important consideration is the agitation of the metals while they are in the molten condition. Thus, when certain metals are alloyed and the molten mass is allowed to remain quiescent, after the melt has been poured off and solidified, it will be found to be composed of a number of different layers and in each layer the composition of the alloy will be different. This, of course, will not do, and in order to avoid such irregularity of alloy composition it is essential to provide proper stirring apparatus in the melting kettle. The nature of the material from which the stirrer is made will depend, of course, on the manner in which the molten mass of metals act upon it. Sometimes iron will do and at other times it is necessary to employ graphite.

Other Details

Sometimes the alloy after being formed is remelted, but this is a practice that is not recommended, for the reason that the more often the metals are melted the more opportunities are presented for the absorption of oxides by the molten mass. This applies particularly to the making of alloys from mixtures of new and old metal.

Pot for Melting Babbitt Metal, Fired with Gas

There are a great number of details concerned with the melting of metals to form alloys and also with the melting of alloys to make castings of one sort or another, and it is understandable that these details are not all of significance to the gas engineer. However, he should be familiar with those that have any influence both on the results obtained with his fuel and on the design of the furnace. It is seen here, as in the other cases of application of industrial gas, that the gas man has to be concerned not merely with the sale of his fuel, but also with the design of the furnace in which it is used. The more the gas industry develops the industrial field, the more it will find that the manufacturer will look to it for advice not only as to the fuel to be used but also as to the furnace in which the fuel will be burned. This simply means that the gas companies must be ready to give accurate advice on this matter and must be in a position to supply the right kind of furnace. The gas industry is simply put in the same position as the electrical industry and it must solve this problem in as efficient a manner, at least, as the electrical industry, if it is to hope to retain such industrial business as it has obtained and secure other similar business.

Copper and Its Alloys

We are now ready to take up in a systematic way the study of the important metals of the non-ferrous type and the alloys that are made with them. We have already mentioned the fact that copper is probably the most important of the non-ferrous metals. It is a metal of great ductility and tenacity and has many important applications in the arts and in industry. But then, again, it possesses a number of disadvantages when used alone and these may make it useless for a great many purposes. It, however, remains a fact that practically all of these difficulties can be removed by alloying the metal in the proper manner with other metals. Thus copper plays an important role in one form or another.

While any metal is affected by small quantities of impurities, it is also a fact that when these impurities are present in large amounts so as to form alloys these disadvantages do not appear. Thus, when a small amount of zinc is added to copper, the result is a metal that is red-short. But then, again, there are certain alloys of copper and zinc which can be readily worked. The most important of these is its best known alloy, brass. Other metals, such as iron, antimony, bismuth, have bad effects on copper when present even in small proportions. The non-metals, sulphur, silicon, phosphorus, are also injurious to the copper, but here again, when these ingredients are present in appreciable amounts, the results are otherwise. For example, in the case of the copper alloy which is called phosphor-bronze, a metal is obtained which is very strong, ductile and has a beautiful color. Another important fact is that the presence of oxides of copper in the metal has a very bad effect on its properties and hence it follows that in melting the copper great care must be taken to see that it is not oxidized. Thus here again the control of the atmosphere in which the melting takes place when this is at all possible, as far as the design of the furnace is concerned, is a very important matter and here again is where gas has a decided advantage over other fuels. For when gas is employed it has been found a simple matter to control the character of the atmosphere within the furnace to suit the requirements of the process.

The Less Important Copper Alloys

Copper alloys with the precious metals. Thus it is alloyed with gold or, rather, gold is alloyed with it, for the copper is added in very small proportions to gold for the purpose of rendering the precious metal more suitable for manufacture into coinage and articles of jewelry and adornment. Gold is too soft to be used in the pure state and therefore copper is added to harden it. Silver is also alloyed with copper for the same reason and the alloys obtained are employed in making coins and in manufacturing silver ware of all sorts. The gas engineer may come in contact with plants in which such alloying is being

carried out, but it is understandable that they will be but few in number and the special problems that arise will most likely not be any more difficult to solve than those that apply to the alloying of copper with base metals. It is, therefore, thought most advisable to omit discussion of the application of gas to such uses and include whatever is said specially in this regard in the description of the use of gas for brass melting. Copper is also alloyed with platinum, but this is not very common.

Alloys with the Base Metals

The alloys which copper forms with the base metals are by far more important than those that are formed with the precious metals. They are among the most important non-ferrous alloys used in industry and in the arts. There are a great number of these alloys, but those that are by far the most important are the ones that are known by the generic terms, brass and bronze. Both brass and bronze, as we know them, have been manufactured for thouhands of years. The ancients were well acquainted with these alloys.

Casting of Copper

Before leaving the subject of copper it must be mentioned that copper is itself used largely in making castings. These castings are employed in making machines, for, as is well known, copper possesses many properties which render it very useful for this purpose. It is also employed largely in the manufacture of parts of electrical machinery, motors, dynamos, switches and the like. One trouble in casting copper has been the tendency of the metal to absorb gases. This is counteracted by the addition of other metals to the copper which remove the gases. Of course, it is understandable that when this practice is followed out, certain impurities are introduced into the metal which render it not so useful for electrical purposes. On the other hand, the addition of these substances have an advantageous effect on the physical and mechanical properties of the copper. Thus in copper casting practice there are two classes of castings, those that have a high electrical conductivity and those which have a high mechanical strength. The casting of electrical copper castings is a difficult matter and involves the use of many different chemicals which are added to the molten mass in order to get rid of the dissolved oxygen in the melt.

Conclusion

The series of articles which deal with the non-ferrous metal industry and the application of gaseous fuel to the heating operations that are carried out in the non-ferrous melting and heating processes has now been carried to the point where it is possible to take up in detail the subject of brass melting. In what has preceded much information of a general nature has been given regarding the properties of various metals and alloys of the non-ferrous series as well as on the general characteristics of the alloying and melting process and of the furnaces that are employed therein. These matters have been discussed at some length and it has been endeavored to give the industrial gas engineer some idea of the technology of the processes involved. This information is by no means as complete as it should be and it is unfortunate that lack of space prevents a deeper discussion of these matters. But the industrial engineer who has a prospect in this field will find it very advantageous to get and read Vicker's book on Metals and Their Alloys.

THE ESSENTIALS OF HOUSE HEATING

(Continued from page 567)

only 12 per cent would give an annual stand-by charge or service charge of $845 for this house, or $70.40 per month before current was supplied. Bear in mind that this figure could not be reduced by using generating capacity that would not otherwise be in use because the heating load would not be off-peak load.

The gas-burning furnace business is in its infancy, but it is rapidly growing into manhood. We have the coal furnace manufacturers to thank for this in large part. They are a progressive up and doing crowd. They have an association, the National Warm Air Heating and Ventilating Association, to which all the reputable manufacturers belong, that is doing real work for the warm air furnace. Instead of trying to cut each other's throats, they are working together to put furnace manufacture and installation on a sound scientific basis. They have endowed a ten-room residence at Urbana, Ill., where, in conjunction with the staff of the University of Illinois, real research work on warm air furnace heating is being carried on.

Application of Warm Air Furnace Design

A lot of the things they learn there about warm air furnace design as applied to coal furnaces can be applied to gas furnaces. They have developed a code for calculating the sizes of various parts of a furnace distributing system that I can recommend without limitation or qualification.

The best furnace in the world is hopelessly crippled if the distributing system is inadequate in size or the circulation of air currents is poor. At a certain air temperature a square inch of warm air pipe has a rather definite heat carrying capacity, depending, of course, on the height of the room it supplies. A square inch of leader supplying air to a riser to a second floor will carry more heat than a square inch of leader supplying a riser to a first floor room.

Leader Areas

A very simple rule has been formulated for calculating leader areas that is quite similar to the handy rule for calculating radiation, but gives more accurate results.

$$\left(\frac{G}{12} + \frac{W}{60} + \frac{C}{800}\right)$$

Multiply this factor by 9 to get area for first floor leaders by 6 for second floor and by 5 for third floor. Risers to the first floor should be of the same area as the leaders, to the second floor 70 per cent of the

leader and to the third floor 70 per cent of the leader. The registers should be of the same size as the leaders. G is the glass area in square feet, W the wall area in square feet and C the cubic contents of the room in cubic feet.

Having calculated the necessary pipe areas it is only necessary to add them together and then, if the furnace to be installed is rated on the basis of leader capacity, select a furnace that will supply the calculated leader area.

Cast Iron in Furnace Construction

(Major Stark was emphatic in his adherence to cast iron as a warm air furnace construction material. He advocated taking the air from the rooms in the house rather than from the outside or from the basement. He warned that with a warm air system more care is required in locating the thermostat than with steam or water. With warm air it is possible to secure the humidity desired and he thought that a warm air system properly installed could be operated at lower cost than any other system. During the latter part of his talk Major Stark illustrated the points made with slides and after the talk cleared up points not made clear through answers to questions that were asked about them.)

THE GAS PLANT AND THE GAS MADE

(Continued from page 568)

winter and summer with existing and tried out types of coal-gas plants and producers, would have a heating value of 440 B.t.u. per cubic foot and a gravity of .57.

Coming now to the quality of gas and type of plant for the peak gas with its large fluctuations in demand, this might be for the present our existing types of carburetted water gas apparatus using coke (made by the base plant) for generator fuel, and producing say with 1.75 gallons of oil per M. C. F. a gas having a heating value of 440 B.t.u. and a gravity of from .57 to .60.

Such peak gas might better be made for large companies as extensions become necessary by manufacturing carburetted water gas say of 580 B.t.u. heating value on existing apparatus, and blue water-gas of say 300 B.t.u. heating value on new blue-gas apparatus, which would give, with equal portions, a peak load gas averaging 440 B.t.u. in heating value.

This arrangement would make it possible to extend for the heating or peak load with a cheap construction and a minimum amount of new apparatus and it would utilize the existing water-gas apparatus in the same manner as at present.

The blue gas and carburetted water gas in this case should go to the same relief holder and through the same purifiers so that the peak gas could be kept well mixed and of a uniform quality before it was delivered into the regular storage holders for mixing it with the base gas.

Tests of Gases

Tests have been made on these suggested base and peak gases, viz., a base gas consisting of a mixture of coal gas and producer gas of 440 B.t.u. heating value and a peak gas consisting of a lightly carburetted water gas of the same (440 B.t.u.) heating value, and it has been found that with appliances properly adjusted for the base gas that the peak gas can be used up to as high as 75 per cent in the mixture without there being any cause for complaint except for the gas irons, some mantle lights and one type of water heater. The use of the gas iron and these particular gas mantles should be practically nil as time goes on.

Further tests have indicated that a 400 B.t.u. base gas of substantially 60 per cent of 570 B.t.u. coal gas and 40 per cent of 130 B.t.u. coke producer gas can be completely switched or used in all existing appliances with 440 B.t.u. carburetted water gas and vice versa, the appliances being equipped with sutable orifices and adjusted for air for either kind of gas, working satisfactorily when switched to the other kind of gas without change of orifices or air adjustments.

Design and Location of Manufacturing Plants

In small situations, and even for fair-sized cities, the entire gas manufacturing plant could be located at one site, gas being pumped out through a properly designed pumping main system to district governors and to outlying or district holders and repumping stations.

In certain larger cities two or three large manufacturing plants could be used on the outskirts of the city, pumping gas to the interior, and these outskirt plants could consist of the coal-gas base plants and also certain amounts of peak gas plants, either of lightly carburetted water gas, or say a mixture of heavily carburetted water gas with a straight uncarburetted water gas (blue gas).

In order to keep down the size of pumping mains and cost of distribution for handling extreme peak load conditions, existing interior and new interior carburetted water gas plants could be used to produce lightly carburetted water gas during the heavy load season, making a somewhat higher heating value quality of gas for a few days in the year, if necessary, so that this particular gas could be used straight as made in that district for any period of time.

If for any reason the main gas manufacturing plants can be located in the central part of a large city, then, of course, the so-called reinforcing plants can best be located on the outskirts.

A Sample Situation

In order that you form some idea, or have a fair picture, of the effect of taking, in a fair-sized Northern city, a total house-heating business of, say, up to 3 per cent of the consumers, I assume a situation distributing, by 1926, gas say of 440 B.t.u., and actively selling gas for house-heating for the next twelve years.

If, by 1937, 3 per cent of the customers are using gas entirely for house heating, then the maximum day send-out will be about double what it would be if no heating business were taken on.

The average daily load during the low send-out summer months would then approximate one-third of this high winter maximum day send-out.

This amount of house-heating business would increase the total amount of gas sold by 30 per cent.

If, however, the house-heating business is secured by the use of a combination gas and oil burner, using a minimum amount of gas, then the maximum day send-out, when approximately 9 per cent of the customers are using this type of heating apparatus, will be increased by 65 per cent, and the gas sold would be increased by approximately 22 per cent.

Now having charted a possible course of procedure and having drawn a rough picture of what is likely to happen, the question naturally arises, how economical and how sound are our present processes of gas manufacture, and what is the likelihood that low temperature carbonization processes and complete gasification processes will be more economical or more sound?

Let us then examine present day processes as they have been developed at their best and compare one with another, and also with the best that can probably be expected with low temperature carbonization processes, and with complete gasification processes.

The Economies of the Process

First, as to economies:

Let us assume for this purpose that in the territory described a good bituminous coking coal of 14,300 B.t.u. is available at reasonable prices. Similar comparisons can be made for poorer grades of coal.

Base Gas, 440 B.t.u. Heating Value

A modern carbonization plant, equipped with central coke fired producers; steam from waste-heat boilers.

B.t.u. in one ton of coal, 2,000×14,300....28,600,000

Products Having Heat Value After Gasification

16,200 ft. of 440 B.t.u.	7,128,000
13.5 gallons of tar @ 160,000	2,160,000
1,000 lbs. coke @ 12,500	12,500,000
Total B.t.u. in products	21,788,000
Per cent recovery	76
Per cent in gas	25

Peak Gas, 440 B.t.u. Heating Value

Waste-heat voilers on blast gases and on blue-gas sets. Steam regenerators and exhaust steam used for gas making.

B.t.u.'s in Materials Used per M.

32 lbs. of coke @ 12,500	400,000
1.75 gallons of oils @ 130,000	227,500
Total B.t.u.'s per M. in raw products	627,500

Products Having Heat Value After Gasification

1,000 ft. 440 B.t.u. gas	440,000
0.25 gallons tar 160,000	40,000
Total B.t.u.'s in products	480,000
Per cent recovery	76
Per cent in gas	70

In a Combined Plant Balanced to Use All Coke Produced in the Base Plant for Making Carburetted Water Gas in the Peak Plant

Base and Peak Gas each 440 B.t.u.

B.t.u. in one ton of coal, 2,000×14,300....28,600,000

B.t.u. in 54.69 gals. oil carburetting @ 130,000 7,109,700

35,709,700

Products having heat value after gasification of the coal and coke:

47,450 ft. 440 B.t.u. gas.....20,878,000

21.3 gallons of tar @ 160,000....., 3,408,000

Total B.t.u. in products	24,286,000
Per cent recovery	68
Per cent in gas	58
Average gallons oil per M. gas made	1.15
Per cent base gas	34
Per cent peak gas	66

By selling coke and increasing the base gas plant to suit local conditions, it will probably be found, especially in Northern cities, that the per cent of base gas produced can be economically increased to as high as 85 per cent, leaving only to be produced as peak gas 15 per cent. In this case the average oil per M. for all gas made would be 0.26 gal.

Low Temperature Carbonization Processes

Much work has been done and many types of trial plants have been built. Just what such plants will produce when finally perfected remains to be seen. Suppose, however, we use the following as production figures possible of attainment:

Again, using one ton of good bituminous coal, we have:

	B.t.u.
In coal, 2,000×14,300 B.t.u.'s, or	28,600,000
Products, say:	
5,700 ft. 700 B.t.u. gas	3,990,000
23 gals. light oils and tars @ 145,000	3,335,000
Soft coke remaining after deducting that used in producers for heating, etc., say:	
1,300 lbs. @ 12,500	16,250,000
Total B.t.u.'s in products	23,575,000
Per cent in products	82
Per cent in gas	14

Suppose we had gone ahead with our plants using our standard processes as indicated to produce 440 B.t.u. gas—and suppose a fairly cheap and workable low-temperature carbonization plant is perfected producing gas, coke, light oils and tars substantially

as we have assumed. How best could we adapt such a plant to our use?

By distilling into various products the light oils and tars we may obtain some oils suitable for use for carburetting purposes in the peak gas apparatus for making peak gas.

Tar Oils and Other Products

Some of the tar oils should be usable for combination oil and gas house-heating apparatus.

If a 700 B.t.u. gas is easily produced with flexible operation of the low temperature plant, such a plant could be installed and operated to produce one volume of 700 B.t.u. gas to 1½ volumes of 270 B.t.u. blow-run blue gas, making what we might call an intermediate gas of 440 B.t.u. heating value and of substantially the same gravity as our adopted base and peak gases.

The soft coke having say 12 to 15 per cent V. C. should be used if possible in the water gas generators, to make peak gas. It is also probable that this soft coke could be used satisfactorily in the producers of the base gas plant, thus releasing more of the hard and salable coke for sale.

There does not appear, then, to be any especial difficulty in utilizing, in a very large plant, a reasonable amount of low temperature carbonization apparatus. In fact, we could start with a base gas plant of low temperature carbonization apparatus and blow-run blue gas sets using oils made and coke produced in peak gas apparatus substantially as outlined. Such a plant might be balanced to produce very little excess soft coke by the end of each year.

Complete Gasification

(a) Complete gasification can now be accomplished with a number of bituminous coals by using good lump coal in simple modified blue gas sets. The quality of the gas produced may be slightly more than 300 B.t.u. or have a much lower than 300 B.t.u. heating value, depending on the amount of blow-run used in the process.

Assuming as before one ton of coal, we have in the coal 28,600,000 B.t.u.

With 10 per cent nitrogen due to the blow run we might produce gas of about 300 B.t.u. with 37 lbs. of coal per M.—or say 54,000 ft. of gas per ton of coal.

Products, 54,000 ft. @ 300 B.t.u.	16,200,000
Per cent in products and gas	57

It is possible that this process can be further developed to a higher efficiency and still produce a gas of 300 B.t.u. quality. At any rate, higher efficiencies could be obtained by making a longer blow-run and producing a gas of lower heating value.

The best prospect for this process is the use of lump bituminous coal for generator fuel and oil for carburetting, producing a 440 B.t.u. base or peak gas until such time as some suitable carbonizing plant can be installed for producing a suitable amount of base gas for that particular situation.

English Process

(b) Complete gasification has been secured in England on what might be called a modified water gas set. The quality of gas will average higher than 300 B.t.u. with possibly an efficiency say above 60 per cent. It is probable that this process, using lump coal, can be developed and made in large units. Its value in the future would probably be for small and medium size plants operating with this process alone and for a standard quality of gas, say not higher than 330 B.t.u. heating value.

(c) The Doherty process of complete gasification is now in the process of development. No definite data can be obtained for publication at this time. It appears probable that the heating value of the gas should approximate 300 B.t.u. and some approximate calculations indicate a fairly high total efficiency or B.t.u. recovery for the gas and tar oils made. The use of this Doherty complete gasification process would mean its complete use with a heating value standard approximating 300 B.t.u., or its use for displacing 300 B.t.u. blue gas for mixing with 580 B.t.u. carburetted water gas; that is, for making part of our so-called peak gas.

Conclusions

Summing up, we may make the following general conclusions:

To satisfactorily handle and economically develop the gas business with our existing perfected types of gas manufacturing apparatus, we need heating value standards at least as low as 440 B.t.u. and possibly as low as 400 B.t.u.

With such a standard we can fashion or make the gas supplied of practically the same gravity throughout the year, notwithstanding wide variations in gas demands.

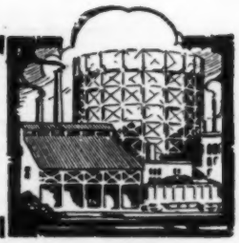
We can begin the supply of this quality of gas at any time, using our existing manufacturing apparatus, and we can shape and direct the plant extensions and improvements so that the base or major portion of the gas supplied throughout the year will be made from bituminous coal—a cheap raw material that promises to remain not only plentiful but fairly uniform in price.

This lower standard of 440 B.t.u. heating value will, especially with the use of coal-gas plants, greatly reduce the amount of oil required for gas making, and this in turn should tend to stabilize the cost of gas oil. Therefore, the cost of any necessary lightly carburetted water gas would be stabilized and much lower than would be the case if a higher heating quality of gas were supplied.

If a perfect and flexible low-temperature carbonization apparatus is finally developed, we can fashion the gas into our 440 B.t.u. heating value standard for use on intermediate loads, and even for base and peak send-out loads, if this becomes economical or necessary.

Complete gasification processes can be used either with a still lower heating-value standard or such apparatus can be used in connection with existing carburetted water gas plants for producing a higher standard heating value gas, say of 400 to 440 B.t.u.

NEWS OF THE GAS INDUSTRY



Industrial Gas Association of New England Discusses House Heating

The November meeting of the Industrial Gas Association of New England was addressed by J. E. Kinner, of the Bryant Heater and Manufacturing Company, and W. E. Stark, research engineer of that company. House heating with gas was the subject treated and the specially large attendance showed beyond a question of a doubt the growing interest among New England gas men in house heating.

All animals, said Mr. Kinner, are creatures of habit. Though the dog has been domesticated for all these hundreds of years he still turns around several times before lying down, because back in his wild state he did so to make a nest for himself.

For generations man has stoked a fire to keep warm in winter. He has laid in a supply of fuel in the fall, paid for it and forgotten about the cost. When we try to sell him gas for heating we are trying to make him do away with the habit of lifetimes. It takes time to get him away from these old habits and persuade him to adopt automatic heating and the invisible fuel, gas.

Advertising

Advertising helps in paving the way by bringing the matter before so many people in so many different angles. All of us have pictures in our minds of something we hope to possess some day and advertising can help paint a mind picture of gas heating. The more pictures we have in our minds the more ambitious we are and for this reason advertising is a good thing.

There must, however, be a systematic organizing of the advertising. The difference between a locomotive and a pile of scrap iron is that one is organized and the other is not.

Mr. Kinner said he believed it was better to allow salesmen to be foot free to work and make calls when they believed they would be most effective. Some people buy what others might want. Some are hard to sell that which will be of the greatest benefit to them. Some buy when there is not enough to go around. The salesman must have an analytical mind and study and approach his prospects from the proper angle.

He said that he did not believe the gas industry was sufficiently sold on the product it was producing. Perhaps the public ought to say to the industry, "You'd better do it with gas."

M. E. Addis Retained as Gas Company Manager

Hartford, Conn.—In connection with the recent change in ownership of the Wallingford Gas Light Company, it is stated that M. E. Addis continues as general manager and also has been elected president of the company and a member of the directorate. Under the management of Mr. Addis the company's physical assets have increased 100 per cent during the past nine years and the annual income is more than 300 per cent of what it was when he took charge. Clarence E. Thompson of New Haven had held a controlling interest in the company since 1905 and the sale of his stock to the Citizens Public Utilities, Inc., of New York, makes the latter practically the owner of the Wallingford plant. It has large assets and Mr. Addis looks for improvements and enlargements of the plant.

Alonzo T. Rand Passes Away

President Minneapolis Gas Light Co. Long Associated with Industry

A dean of the gas industry passes. Alonzo T. Rand, president of the Minneapolis Gas Light Company, died suddenly on October 31, while hunting with friends in the North woods. The hunting party was about to end an outing which began several weeks before and which had taken Mr. Rand and his friends deep in the Canadian wilds, north of the Minnesota line. He appeared in good health and, according to the members of the party, seemed to have enjoyed his outing. He arose early Saturday morning to begin a final day's shooting, but had taken only a few steps from his cabin where he was found dead.

Mr. Rand, from his boyhood days until the time of his death, was intimately connected with the gas business. He was born in Buffalo, N. Y., August 9, 1854. His father, A. C. Rand, gained a national reputation as an investor and producer of gas. He moved to Minneapolis in 1872, when he purchased the gas company in that city and it was there that Alonzo T. entered the business as a boy 18 years of age. He worked his way through all the various departments of the company, giving particular attention to the engineering details. He became president in 1901 and continued in that position until his death. He was associated with his brother, Rufus R., who died three years ago, holding the position of vice-president and treasurer.

In the early days when game was plentiful in the outskirts of

Minneapolis Mr. Rand became a devotee of hunting and fishing and that became a lifelong sport in which he found his greatest pleasure.

Mr. Rand was an outstanding factor in many business activities in the city of Minneapolis. His charities were numerous and in all his work he was modest, as he was in private life.

Mr. Rand died leaving no family, but the management of the Minneapolis Gas Light Company will continue under the direction of his cousin, Arthur H. Rand, and his nephew, Rufus R. Rand, Jr.

New England Commercial Men Hold First Meeting of Season

At the opening meeting of the season the New England Association of Commercial Gas Managers made a change in the time and the place of the meeting. Instead of meeting at Young's Hotel at 4 p. m., as has been the custom in the past, it was decided to hold a dinner meeting at the Boston City Club at 12:30 on Friday, November 13, 1925. The large attendance indicated that the membership approved of this change.

The secretary, S. A. Mace, read a letter from the president, Edward J. Cooney, which stated that since he is not now a commercial manager he is no longer entitled to membership in the association, he was forced to resign as president, but would continue to do all that he could within the constitution of the organization to further its interest. Since Mr. Cooney is now engaged in the selling of appliances for the Eastern Service Company it was necessary to accept his resignation and a vote of appreciation for what he has done for the association was passed.

The Speaker of the Day

The speaker of the day was Mr. Edward Stanley, credit man for the Enterprise Knitting Company, Needham, Mass., who, after James S. Bruyn of the Citizens Gas Light Company, Quincy, Mass., David J. Lear of the Boston Consolidated Gas Company, and John J. McCurren of the Haverhill Gas Light Company, had been accepted as members by vote of those present, talked on the subject of "Unique Selling Experience."

He told of some direct by mail selling experience which it was thought would be of value to the sales managers in the gas industry and that some of the ideas put forth could be adopted by those present to further the sales of gas appliances.

Mr. Stanley told of how he decided to go into the knitting business and that the most promising field seemed to be the knitting of artificial silk neckties. Accordingly, a machine was purchased and set up and some ties knitted. The problem then arose of selling them.

Making up a list of 4,000 retail dealers in New England, the names and addresses being taken from Bradstreets, he mailed each a box of a dozen ties, suggesting that they sell them for 59 cents and that if they were satisfied with the ties they mail back a check for $4.50. He stated that 3,750 of those dealers paid for the ties and even now checks for $4.50 are coming in from those who did not pay. Since it would have been necessary to pay 10 per cent commission to sell them through salesmen, this showed a decided gain even if the postage, the three-cent insurance and the loss through nonpayment was all totaled as cost of selling. He also found that the ties made friends of the 4,000 dealers.

Up to this point all the business had been confined in New England. Most of the resales to the dealers were made only when new boxs were mailed after it was thought a proper interval had expired.

A. G. A. Committees Meet

With the exception of the Manufacturers' Section of the American Gas Association, meetings of all the managing committees for the purpose of laying out work for the coming year were held previous to the meeting of the Executive Board on Wednesday, November 18. A record-breaking attendance was reported by the secretaries of all sections and a note of optimism was struck in all of the meetings.

On the evening of Tuesday, November 17, President Abell tendered a dinner to the chairmen, vice-chairmen and secretaries of the sections at the Engineers' Club. This meeting was held for the purpose of getting the various members acquainted with each other and has now come to be an annual affair at which there is a discussion of association activities contemplated for the coming year.

A dominant theme struck at this get-together dinner was National Advertising. Speaking in behalf of the Commercial Section, Mr. Canniff, chairman, explained that section's plan of advertising and intensive development of sales opportunities.

Mr. Cauley, chairman of the Industrial Gas Section, spoke briefly on the Industrial Gas Advertising Program, which he hoped the board would approve.

Mr. Blanchard summed up in behalf of the Advertising Section and made a plea for a general campaign which would take into consideration all of the other sectional plans.

Other talks were made by representatives of the Manufacturers', Technical and Accounting Sections' Managing Committees.

In commenting on the advertising situation, President Abell said that he would bring the matter before the board meeting and would probably ask for authority to appoint a special committee whose function would be to deal directly with the entire problem of national advertising.

At the meeting of the board on Wednesday, November 18, the president appointed the following as members of this Special Committee on Advertising—Clifford E. Paige, chairman; B. J. Mullaney, Oscar H. Fogg, Charles A. Munroe, D. D. Barnum and F. J. Rutledge.

Other members who will also serve on the committee are the chairmen of the Publicity and Advertising, Industrial Gas, Manufacturers' and Commercial Sections.

"The Fellow Worker"--Employee Training

Gas Sales Association of New England Holds First Meeting of the Year 1925-1926

Friday, November 13, was no hoodoo day for the Gas Sales Association of New England, for on this day the first meeting was held for the year 1925-1926. One hundred and ninety-six members and invited guests were present at the very enthusiastic meeting.

A little diversity took place at this meeting, as it was held in the Jordan-Marsh Company building in Boston, instead of the usual meeting place, the Boston City Club.

The reason for this change was that the officers of the Jordan-Marsh Company (one of whom addressed the meeting) desired that the members of the Gas Sales Association acquaint themselves with the quarters which the company had turned over for their employees.

The dinner was served in the large spacious dining room of the Jordan-Marsh Company, located on the ninth floor of their building. Entertainment was furnished by employees of the company, consisting of soprano solos. Mr. William Anderson, superintendent of gas distribution of the Lynn Gas & Electric Company, also sang as a solo "Old Black Joe." He was encored several times and finally had to repeat one verse in order to satisfy those present.

Gas Men Sing

Owing to the absence of Mr. H. J. Pettingell, Jr., the singing was led by Charlie Powers, song leader of the Cambridge Rotary Club. At the conclusion of his efforts he was cheered to the echo by the Gas Sales Association. In commenting upon Mr. Pettingell's absence, Governor Quinn, of the association, remarked that this was the first meeting in six years that Mr. Pettingell has been absent. The Governor also explained that Mr. Pettingell was away attending a football game and therefore could not be present.

Before introducing the speaker of the evening Governor Quinn appointed the following members of the Gas Sales Association to serve on the various sections of the American Gas Association:

M. L. Hatch, Accounting Section; Guy E. Stephen, Commercial Section; J. A. MacPherson, Publicity and Advertising Section; Howard R. Smith, Industrial Section; Walter K. Stafford, Manufacturers Section; Charles Otten, Technical Section.

Mr. Quinn also referred to the meeting of the New England Gas Engineers, which will be held at the Hotel Somerset on February 24 and 25. Mr. Philip Cabot, of the Harvard Business School, will make an address on "Selling More Gas to Our Present Customers."

Prizes for House Heating Window Displays

The Gas Sales Association of New England since its inception has always endeavored to stimulate interest in the gas business and to raise the gas industry to the heights which it is expected to reach. In following out this line of endeavor, the association offered two prizes to the gas companies in New England for the best house heating window display prior to October 15. A committee was appointed with Mr. M. B. Webber as chairman. The first prize consisted of $100 in cash and the second prize $75. Mr. Webber presented his report at this time which awarded the first prize to the Pawtucket Gas Light Company and the second prize to the Blackstone Valley Gas & Electric Company. The report complimented these companies on their display and photographs were shown giving the arrangements of the prize winning store windows.

The speaker of the evening was Mr. Walter A. Hawkins, vice-president of Jordan-Marsh Company, and in charge of the personnel work of this company. Mr. Hawkins chose for his subject, "Merchandising—Employee Training." His talk was most interesting, as it gave the inside workings of what a large department store is doing for its employees. He held the attention of every member of the association during his talk.

In introducing Mr. Hawkins, Governor Quinn stated that he was vice-president and an officer of the Jordan-Marsh Company and that it was through his efforts that the Gas Sales Association was privileged to hold their meeting in these quarters.

When he arose to speak, Mr. Hawkins stated that he would prefer not to be called by the names he was introduced by, but rather simply a "fellow worker," as this was the name every employee of the Jordan-Marsh Company was familiar with and known by.

The speaker stated that he interviews thousands of people every year for positions and the part where most of these people fall down is that they have no personality and "pep." College boys, graduates of high schools, come into his office, and while they have received a good education, they lack entirely the enthusiasm and "pep" so necessary and important in the business world of today.

Mr. Hawkins said in part:

"We have no employees in the Jordan-Marsh Company; we are all known as 'fellow workers.' We have a Jordan-Marsh law, which states that all higher positions must be filled by someone in the company, who is the logical one next in line. It is a crime to go outside a man or a woman for a higher position; the vacancy must be filled from the ranks of the employees. This Jordan-Marsh law must be lived up to and every employee knows that when a higher position is open it will be filled from the ranks of the employees."

The Customer Is the Boss

The speaker brought out the point that the boss in a department store or the gas industry is not the president of the company, vice-president, officers or superintendent.

"The real boss," said the speaker, "is the customer." It is the customer who pays you your wages and if it wasn't for the customer you might lose your job. When the president or some officer of your company comes along, you don't need to jump to your feet, but when your customer comes in that is the time you want to jump.

Employment Department

"The Jordan-Marsh Company spends considerable money in the course of a year in hiring employees. A large part of our eighth floor is devoted to the employment

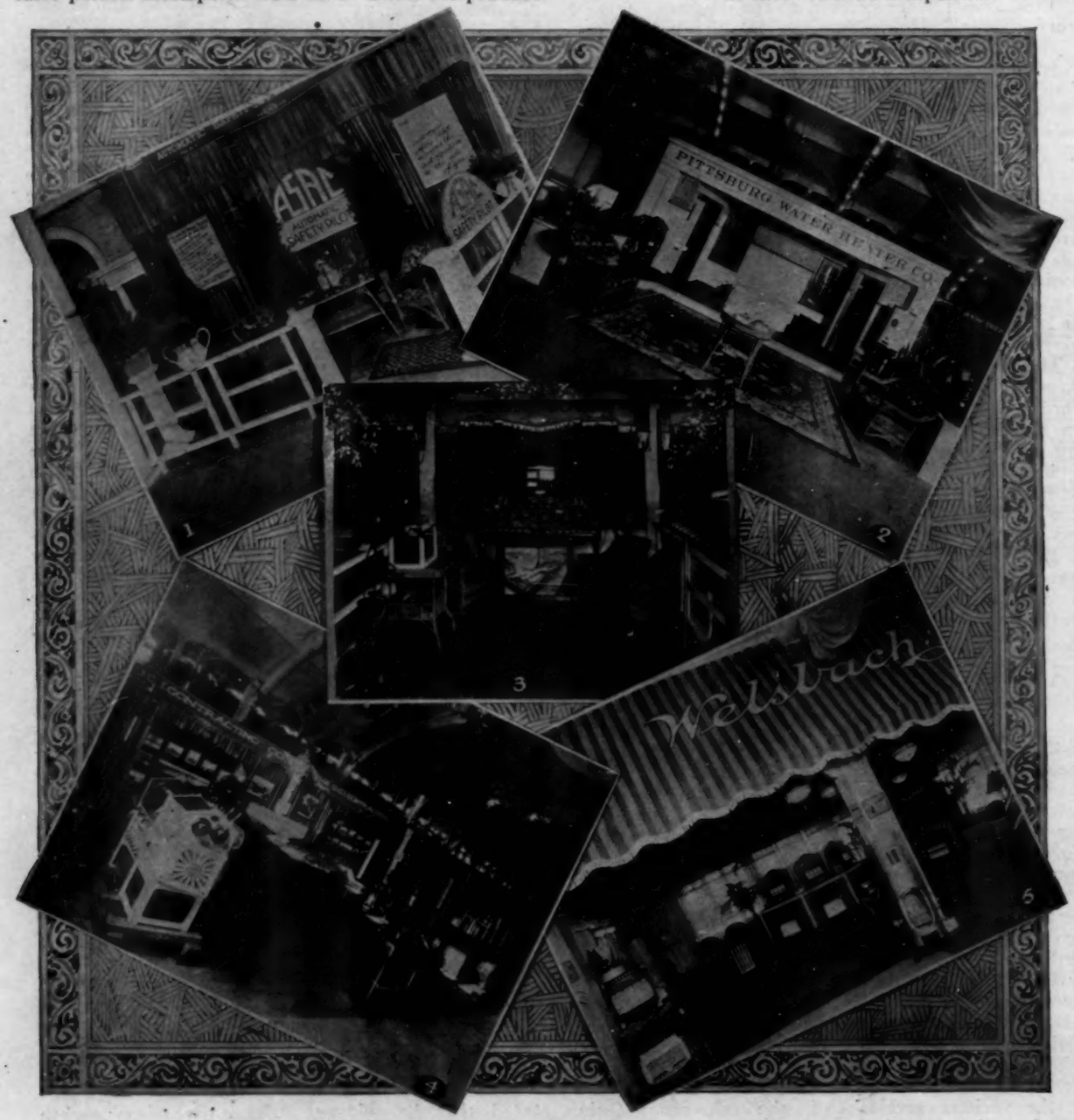
offices. We have a woman who hires all the female help for our organization. We believe that women understand women much better and a woman can fool a man much more easily than she can a woman. We also have a man to hire all the male employees.

"We believe," continued Mr. Hawkins, "that it is very poor policy to have an inexperienced sales person attempt to wait on a customer. Accordingly, we have an educational department. This department has 12 women, most of whom have been school teachers. We make it a rule that before a fellow worker can wait on customers he must have had at least three days' period of training. This is also true in your business, the person who sells or comes in contact with the customer must know his product.

Pensions

"When our employees reach the age when it is impossible for them to attend to their daily duties, we provide them with a pension.

Many of the members of the Gas Sales Association carried home with them ideas obtained from this meeting which they intend to adopt and put into practice at their various companies.



SOME EXHIBITS AT THE ATLANTIC CITY CONVENTION

1—Automatic Safety Appliance Corp. 2—Pittsburgh Water Heater Co. 3—Acme Brass Works. 4—U. G. I. Contracting Co. 5—Welsbach Co.